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ABSTRACT

To discover in explicit, definable terms just what characteristics distinguish the writing of older writers from that of younger ones would give teachers a better chance of teaching young children more successfully--of helping them mature. A passage was presented to hundreds of students in grades 4, 6, 8, 10, and 12. Fifty papers were chosen from each grade; these papers were equally representative of students with low, middle, and high scores on standardized achievement or ability tests. Students were told to study the passage and re-write it in a better way without omitting any information. What every student did to every one of the sentences he was told to re-write was tabulated. The results of this effort are discussed in detail. The writing skills of adults were also examined; conclusions concerning their level of language maturity are discussed. (CK)

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# Another Probe Into Syntactic Maturity

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*A paper read at the NCTE Convention, Milwaukee. November 30, 1968*

Any person who reads the sentences written by young children, say fourth graders, will certainly feel intuitively that those sentences are different from the ones written by older children, say twelfth graders. Not only is there a difference in what is said, but a difference in how it is said. And the difference in how is not just a difference in vocabulary, or in figures of speech. The sentence structures of the younger children are felt to be simpler in some vague and undefined way, and those of the older children to be more complex in some equally vague and undefined way.

For several decades various researchers have tried to replace those vague and undefined terms with objective, quantitative, and scientific terms. Surely if all intuitions agree there must be some objective basis for the intuition, if only we could isolate the basic tendencies.

The motivation for such research is partly that for all pure science: the desire to know, to say it like it is. But probably all researchers have a further dream: that if we knew in explicit, definable terms just what characteristics distinguish the writing of older writers from that of younger writers, then we would have a better chance of teaching them more successfully—of helping them mature. That is the dream of the applied scientist, at least the applied scientist in educational research.

Though I think the present study penetrates another strata of rock, I must assure you at the outset that I have not struck a gusher. If what is released is only gas, at least the gas will burn with a flickering light that can indeed illuminate part of the English class if other researchers and teachers will only refine the project judiciously.

But the educational researcher who is prophet enough to say "Here is an idea that might have value in the classroom" runs a serious risk. Such a prophet is in danger of being heard by no one but propheteers. I am afraid that some of the vogue for transformational grammar is false prophecy, true profiteering. An English course that teaches nothing but

transformational grammar year after year and teaches it mechanically rather than insightfully may turn out to be as sterile as the old grammar school that taught nothing but Latin.

Several years ago in describing what I called Recent Measures of Syntactic Maturity I found myself reading fourth grade sentences and then going on to say that if eighth graders had said the same thing they would have done so in such and such a way. I realized as I said it that I was generalizing beyond my data, conjecturing without proof. And I realized at the same time that there was no need to conjecture. One ought to be able to find something that both fourth graders and eighth graders could say but say in their own way. My colleague, Professor Roy O'Donnell, was already working on the problem and had devised one experimental instrument. With the help of a half dozen graduate students who are trainees under a U.S. Office of Education financed program we began a dozen pilot projects. On the basis of those pilot projects we asked Professor O'Donnell to work up a new instrument. The instrument we finally used consists of a piece of connected prose thirty-two sentences long, with each sentence simpler than would ordinarily be created by even a fourth grader. You might think of each sentence as a kernal sentence.

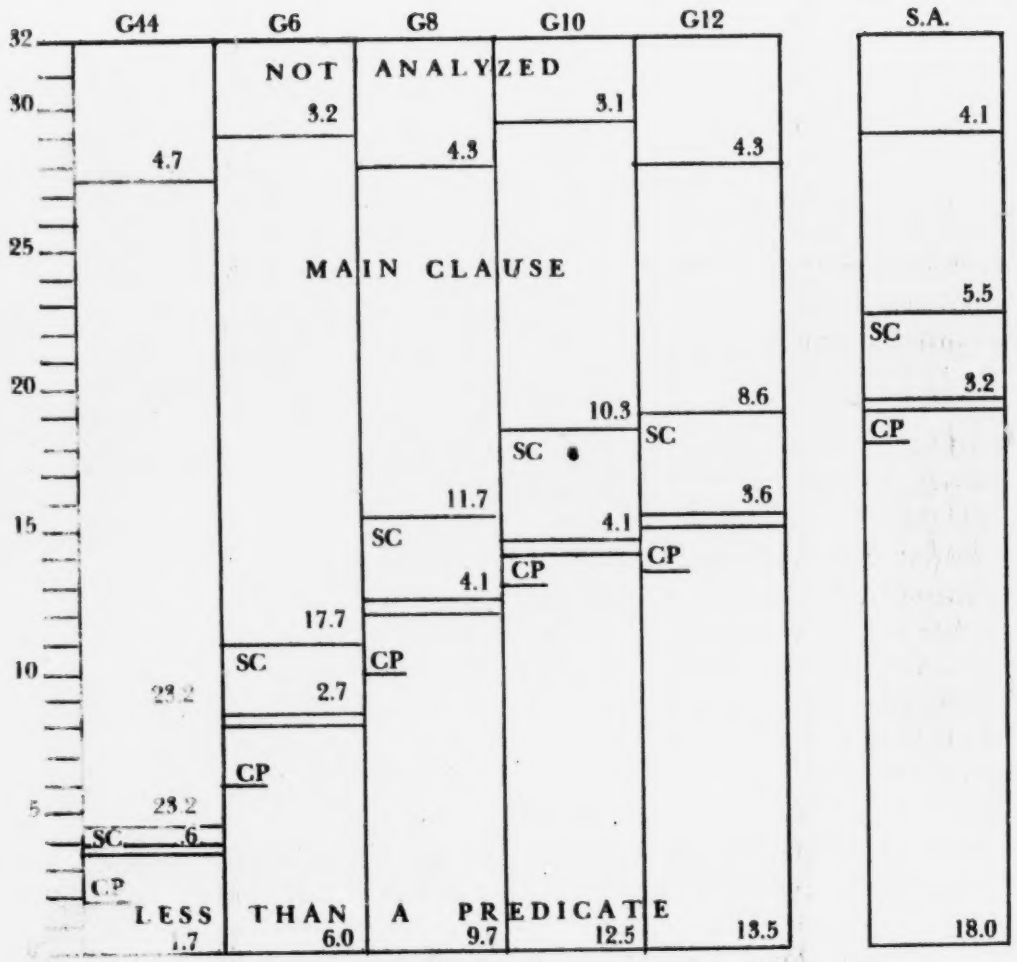
We would have been glad if we had been able to instruct our students simply to re-write the passage in a better way. But our pilot studies showed us that if we did so we simply unleased the creative impulses of some students—they tried to make the passage more interesting by introducing a considerable amount of extraneous material. When they did that, they no longer were all saying the same thing. Admittedly our passage is dull, and I will congratulate the person who creates a livelier one, but it did give them something to say. Our final directions, as I will read them to you in a moment, outlined for the students the kinds of changes we were willing for them to make and kept them from making many of the changes that would invalidate the experiment. Our printed directions were these:

> Read the passage all the way through. You will notice that the sentences are short and choppy. Study the passage, and then re-write it in a better way. You may combine sentences, change the order of words, and omit words that are repeated too many times. But try not to leave out any of the information.

Our passage was presented to hundreds of students in grades four, six, eight, ten, and twelve, that is, at two year intervals from grade 4 through 12. We then chose fifty papers from each grade, two hundred fifty papers in all. We selected the papers from students whose scores on standardized achievement or ability tests were such as to give us a

Syntactic Structures

Produced by each grade



normal distribution from high to middle to low. We then proceeded to tabulate what every student did to every one of the sentences we told him to re-write. We tabulated some seven thousand of these, and found that they showed certain tendencies which I think had not been demonstrated before.

In describing the results of the experiment it is convenient to think in input-output terms. The input of each writer was thirty-two sentences, each one a short, simple main clause; the output was whatever the writer wrote. The grammatical structures that were the output from each grade can easily be presented in a series of bars with the grade four bar to the left, then grade six bar, then eight to the right, and so on. The bar labeled S.A. will be identified later. But some of the categories will need to be explained. For instance, across the top of the bar you see a category labeled "Not Analyzed." That indicates the number of kernels (actually about three or four kernels for each grade) that were either omitted by the students doing the re-writing or else were omitted by the analyst. They might have been omitted by the writers simply because they were forgotten or because they were regarded as being redundant with some other kernel. Or they might have been omitted by us analysts because they appeared in a sentence that contained extraneous material or inaccurate material which therefore had to be excluded and ignored. On the average about three or four kernels were not analyzed for each grade, so we will now look at what syntactic changes were made in the remaining twenty-eight or twenty-nine kernels which did survive to be analyzed.

As you see, the number of input main clauses that survived as main clauses in the outputs for the various grades decreases from grade to grade. That is the first significant observation. For the fourth grade the average number of main clauses is about twenty-three, for the sixth grade about eighteen, for the eigth grade about twelve, tenth grade about eleven, twelfth grade about nine. What did the students do to the other remaining input sentences?

The total space underneath the main clause section represents the number of kernels that were reduced to less than a main clause, that is to a subordinate clause or a non-clausal structure.

Directly below the main clause category you see two small categories which are of minor importance for syntactic maturity. The first is the number of input sentences that were reduced to subordinate clauses by the use of a relative pronoun or by the addition of a *when* or an *if* or something of that sort. About half the fourth graders re-wrote some one of the thirty-two main clauses as a subordinate clause, so that part of the bar is about one half a unit wide for fourth graders. Sixth graders on

the average re-wrote between two and three main clauses as subordinate clauses. Eigth graders re-wrote about four main clauses as subordinate clauses. Grade ten re-wrote almost exactly the same number, and grade twelve re-wrote no more. In summary then we see that there is an increase in the number of subordinate clauses re-written for each grade but the increase occurs only up until about grade eight in this experiment. After that the number of subordinate clauses levels off. The increase in subordinate clauses is not a major factor in syntactic maturity as shown here.

The remaining space on the bars, the space below the subordinate clause category, represents the number of kernels re-written as non-clausal structures, "less than a clause" we might call them.

Just beneath the subordinate clause category you first see the number of coordinate predicates that were re-written by each grade. By a coordinate predicate we mean a structure such as "Aluminum is a metal *and is abundant*." Or "Aluminum is abundant *and has many uses*." Or "It has many uses *and comes from bauxite*." The number of coordinate predicates is about the same from grade to grade; it is close to two.

The major syntactic change that occurs from grade to grade in this experiment is the increase in what is here called "Less than a Predicate." What we mean by this category must of course be explained, but before explaining it, let me indicate the magnitude of the increase. Fourth graders reduced on the average between one and two main clauses to less than a predicate. Sixth graders reduced about 6 to less than a predicate. Eighth graders reduced about ten. Tenth graders twelve or thirteen. Twelfth graders thirteen or fourteen. When you look at the barred graphs as a whole series representing development across eight of the public school years, the chief impression that leaps to your mind is that the number of main clauses is reduced from grade to grade, and the number of clauses that become less than a predicate increases correspondingly from grade to grade. The major change is from one to the other.

But the present study did not stop with the writing of schoolchildren. One needs to know whether the direction of development outlined here is going in the wrong direction—a direction which skilled adult writers resist and perhaps even reverse. And even if the direction taken by schoolchildren is not wrong, does the development stop at the level achieved by twelfth graders, or do skilled adults carry it still farther? Surely it would be possible to carry the tendency to such an extreme that sentences would become virtually unintelligible. How far is too far?

To answer these questions we solicited the aid of a number of per-

sons who had recently published non-fiction articles in *Harpers* and *Atlantic*. We sent each one exactly the same page we had sent the schoolchildren. Finally we got twenty-five of them to respond. These twenty-five skilled adults gave us an answer to our question in unequivocal terms. The schoolchildren were not moving in the wrong direction. Skilled adults carried considerably farther the tendency already described.

The skilled adults appear on your bar graph as S.A. You will see that they retained still fewer input sentences as main clauses: about half as many as twelfth graders. They wrote about the same number of subordinate clauses and the same number of coordinated predicates as the older schoolchildren. But they reduced still more input kernels to less than a predicate.

What I called earlier another probe through a strata of rock in the study of syntactic maturity is simply the direct demonstration that as schoolchildren get older they do indeed use a larger number of those transformations which reduce kernel sentences or base sentences to structures that are less than a clause, less than a predicate, and that skilled adults do still more of that.

The problem presented here is certainly artificial in one sense, but only by presenting all writers with the same information is it possible to factor out the subject matter variable. And only if they are fed untransformed sentences can we tell waht transformations they would employ. This is a laboratory experiment, not a field trial.

I know how abstract this talk must seem. Let me try now to make it more concrete by showing you the sentences we presented to all the writers and then showing you how a fairly typical skilled adult re-wrote the whole passage.

So far I have spoken only of the relation between this syntactic measure and the chronological age of the writers as represented by their grade level. However, this measure is not related to chronological age alone. It is, as I will now show, related to mental maturity or achievement as measured by standardized tests. You will recall that we chose out fifty students in such a way as to give us a normal curve of standardized scores from high to low. We divided that fifty into the top third, the middle third, and the low third. Within every one of the five grades we found that the high group scored higher on the suntactic measure than did the middle group, and the middle group scored higher in syntax than did the low group. Furthermore, the difference between the high

group and the low group was statistically significant within every one of the five grades. Furthermore, at every grade level there is a significant correlation between the rank of the writer on the standardized tests used and his score on the syntactic measure. Whereas to be significant at the .05 level the correlation needs come only as high as .23, the correlation within each grade ran actually between .40 and .61. We can conclude then that the number of reductions to less than a predicate is a significant measure both of chronological maturity and, among students of the same age, a measure of academic achievement or of mental maturity as well.

To talk about the number of reductions to less than a predicate or less than a clause may seem to have little relation to the tradition of quantitative syntactic research as it has developed over the last half century. However, it can be shown that there is a very clear relationship between the measure I have been discussing and other measures such as clause length and T-unit length. For instance, suppose that a writer reduced the second sentence and the third sentence to less than a predicate, less than a clause, consolidating them into the first main clause which was given. That first main clause might now read *Aluminum is an abundant metal with many uses*. Notice what has happened to the mean clause length. Originally we had three clauses containing e'even words with an average clause length of a little under four words. We end up with one clause that is eight words long, so that the mean clause length has been increased from less than four to eight. The reduction of one main clause to less than a predicate and the consolidation of it into another clause will always have the consequence of lengthening the surviving clause. If it were the case, as it is not, that all input main clauses were the same length and all reductions to less than a predicate deleted exactly the same number of words, then it would be true that the correlation between the number of reductions to less than a clause and mean clause length would be perfect. Such of course is not the case. Some kernel sentences are longer than others, and some reductions delete more words than others; therefore the correlation is not perfect. But it is significant, and it is quite high. In fact, if we take those two scores for each one of our 250 students, we find that the correlation between them turns out to be .85.

This fact is useful in two directions. It tells us something about normal writing. It lends credence to the notion that the reason why mean clause length in the normal writing of students does increase from grade to grade is because their capability to perform these linguistic reductions also increases from grade to grade. And, in fact, clause length does increase from grade to grade, as has been shown in expository writing

Kernel Sentences Used in the Study

K 1 Aluminum is a metal.
K 2 It is abundant.
K 3 It has many uses.
K 4 It comes from bauxite.

1. Aluminum, an abundant metal or many uses is obtained from bauxite,

K 4 Bauxite is an ore.
K 5 Bauxite looks like clay.

a clay-like ore.

K 7 Bauxite contains aluminum. (omitted)
K 8 It contains several other substances.
K 9 Workmen extract these other substances from the bauxite.

2. To extract the other substances found in bauxite,

K10 They grind the bauxite.
K11 They put it in tanks.
K12 Pressure is in the tanks.

the ore is ground and put in pressure tanks.

K13 The other substances form a mass

3. Under pressure these other elements form a mass,

K14 They remove the mass.

which can be removed.

K15 They use filters.
K16 A liquid remains.

4. The remaining liquid is filtered

K17 They put it through several other processes

and put through other processes

K18 It finally yields a chemical.
K19 The chemical is powdery.
K10 It is white.

which finally yield a powdery white chemical,

K21 The chemical is alumina.
K22 It is a mixture.
K23 It contains aluminum.
K24 It contains oxygen.

alumina, a mixture of aluminum and oxygen.

K25 Workmen separate the aluminum from the oxygen.
K26 They use electricity.

5. The oxygen is removed by electrolysis,

K27 They finally produce a metal.
K28 The metal is light. (omitted)
K29 It has a luster.
K30 The luster is bright.
K31 The luster is silvery.

leaving a bright, lustrous silvery metal,

K32 This metal comes in many forms.

which is marketed in many forms.

from grades three to five to seven by O'Donnell and others, and, in expository speech, from kindergarten to grades one, two, three, five, and seven also by O'Donnell, and has been shown also by Hunt in the study of normal writing in grades four, eight, twelve and by skilled adults. It could also be shown that these linguistic operations explain the increase in T-unit length and sentence length, but that has been shown elsewhere and need not be repeated here. In effect then, this present study goes one step farther in explaining the facts that have been accumulating for fifty years in the traditional studies of syntactic development.

The high correlation between scores on the number of such reductions and the scores on clause length has significance in a second direction. That means that if the present instrument were to be used as a test of syntactic maturity it would not be necessary in scoring the papers to count laboriously the number of reductions to less than a predicate or to less than a clause. Instead it would be possible simply to figure the mean clause length, that is, the total number of words per paper divided by the total number of clauses per paper. Anyone can count the words. A fairly competent grammarian can count the number of clauses in a paper of this length in about two minutes. The instrument used here thus becomes, in fact, a new kind of test of syntactic maturity that can be administered in a 40 minute class period to any student in any grade from four to twelve and probably through college. For purposes of educational research at least, this instrument may prove to be useful. Certainly it beats counting the clause length or the T-unit length in a thousand words of a student's free writing. It is ten times as easy and more uniform.

A student's mean clause length score on this test is certainly a discriminating measure. At every one of the two year intervals the difference in means is significant at the .05 level. So much for chronological maturity. And within each of the five grades the difference between the high third as measured by the standardized tests and the low third is also statistically significant. So much for mental maturity. And among skilled adults twenty-three out of twenty-five had higher scores than the average twelfth grader; twenty-two out of twenty-five had scores higher than the mean for superior twelfth graders.

We also tested twenty-five firemen whose schooling was twelfth grade but no higher. Their scores were not significantly higher than those for twelfth graders, but not lower either, some of you will be relieved to hear. College students, I would suppose, would score somewhere between twelfth graders and skilled adults. At least I would expect them to do so as long as they are uncontaminated by the study of transformational

grammar. Once they have touched that stuff their scores may skyrocket even though their writing remains stylistically abominable. At least that is what happened in a graduate class of mine.

I am not trying to sell the test. In fact Dr. O'Donnell and I will give it away to anyone who will give us credit and send us a copy of his findings to add to what we might call norms.

What has been reported here is both a test and an experiment. The test may be useful in the same way that other tests are, that is, in a brief time and under uniform conditions it gives information about a student that otherwise would take much more time to get.

As a laboratory experiment it isolates, defines and demonstrates one aspect of linguistic behavior which changes with time, and varies with individual mental maturity and achievement. The kind of behavior demonstrated seems to explain much of the information accumulated in other studies. The form of the experiment used here can be used by many researchers to answer questions that remain.

But let me end with a few words of caution. First of all, I have never said that this instrument measures writing ability. No one knows how important or unimportant these skills are among the wide variety of skills that go into good writing. Second, I have not claimed that this instrument measures all there is to syntactic skill. Intuitively I feel sure that other factors are involved which no one has measured yet. I have simply said that what this measures is closely related to chronological maturity, and is closely related also to what the standardized tests call mental maturity or achievement.